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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,500	02/27/2004	Evan George Colgan	YOR920030527US1 (8728-665)	9091
46069	7590	04/21/2006	EXAMINER MITCHELL, JAMES M	
F. CHAU & ASSOCIATES, LLC 130 WOODBURY ROAD WOODBURY, NY 11797			ART UNIT 2813	PAPER NUMBER

DATE MAILED: 04/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

Office Action Summary	Application No. 10/789,500	Applicant(s) COLGAN ET AL.	
	Examiner James M. Mitchell	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) 29 and 33-40 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19, 21-28 and 30-32 is/are rejected.
- 7) ☒ Claim(s) 20 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>2/27/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This office action is in response to applicant's election filed November 25, 2006.

Election/Restrictions

2. Claims 33-40 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species and subspecies¹, there being no allowable generic or linking claim. Election was made **with** traverse in the reply filed on November 25, 2006. Applicant argues that the restriction is improper, because the entire application can be examined without serious burden. Because the field of search for the features and search for species 5D that comprises a **thermal material between interdigitated thermal fins**, and the search for species of Fig. 10 that comprises a **thermal material between mesas** formed in the chip and a **"planar...heat conducting device** are mutually exclusive, search for both would constitute undue burden. See M.P.E.P §§ 806.05, 806.06. Since applicant has not provided any evidence except to rely on mere conjecture that there would be no burden, the restriction is deemed proper and final.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore with respect to claim 20, the "density of gaps...increases toward edge region" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

4. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

¹ The restriction requirement incorrectly labeled the subspecies as being drawn to "A) ...compliant layer" and "B)...compliant layer," while "B)" should have been drawn to a rigid material. Applicant elected the compliant layer; therefore claim 29 is also included in claims withdrawn.

6. Claims 1-7, 10, 19, 22, 24, 26 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Kurlhara et al. (U.S. 4,649,990).

7. Kurlhara² (Fig.1) discloses:

(cl. 1, 22, 26) a semiconductor/ MCM package, comprising: a semiconductor chip/plurality of chips (10) having a plurality of first thermal fins (20) on a non-active surface of the semiconductor chip, wherein the first thermal fins longitudinally extend across the non-active surface of the semiconductor; a heat conducting device having a plurality of second thermal fins (16a) on a mating surface of the heat conducting device, wherein the second thermal fins longitudinally extend across the mating surface of the heat conducting device; and a thermal joint formed between the non-active surface of the semiconductor chip and the mating surface of the heat conducting device, the thermal joint comprising a plurality of interdigitated thermal fins (20,16a) separated by a compliant thermally conductive material (21), wherein the interdigitated thermal fins comprise the first and second thermal fins (20,16a), and wherein a gap size between the interdigitated thermal fins of the thermal joint varies across the thermal joint (e.g. distance between fins, 16a compared to 20); and oriented to extend in a direction that passes through a neutral stress point of the semiconductor package (e.g. fins pass over the entire chip, and therefore all points of chip);

² Alternatively cited art Babuka et al. (U.S. 4,254,431) could have been used to anticipate the claimed invention.

(cl. 2) a fixed gap size between interdigitated fins (e.g. top fins; Fig. 1) while providing a different fixed gap size (e.g. space between fins) between interdigitated fins in a different band (e.g. bottom fins);

(cl. 3) fixed width of (fins in top portion & fixed width of fins on bottom portion) while providing different pitch between a first fin in a second fin in a different band (e.g. pitch/gap between top fins compared to fins on bottom);

(cl. 4) with fins in different bands (e.g. top fins compared to bottom fins having different widths);

(cl. 5, 6) with heat conducting device of bottom fins (e.g. closer/smaller in pitch) greater than thermal conductivity by other band of interdigitated fins;

(cl. 10, 24, 27) wherein the heat conducting device (16) is a package lid, cap, sink, plate or thermal hat (Fig. 1);

(cl. 7) and oriented to extend in a direction that passes through hot spot areas of the semiconductor package (e.g. fins pass over/ above active area);

(cl. 19) wherein gaps are formed in one or more fins (e.g. space between fins³)

8. With respect to the intended use limitation "to enable....," the prior art forms the same structure as claimed. Therefore the limitation does not impart patentability, since it has been held that the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

9. Claims 1, 10, 21-28, 30-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Horvath et al. (U.S. 5,052,481).

10. Horvath (Fig. 3A, 7) discloses:

(cl. 1, 22, 26) a semiconductor/ MCM package, comprising: a semiconductor chip/plurality of chips (11) having a plurality of first thermal fins (14) on a non-active surface of the semiconductor chip, wherein the first thermal fins longitudinally extend across the non-active surface of the semiconductor; a heat conducting device having a plurality of second thermal fins (43) on a mating surface of the heat conducting device, wherein the second thermal fins longitudinally extend across the mating surface of the heat conducting device; and a thermal joint formed between the non-active surface of the semiconductor chip and the mating surface of the heat conducting device, the thermal joint comprising a plurality of interdigitated thermal fins (14, 43) separated by a compliant thermally conductive material (Col. 11, Lines 21-24), wherein the interdigitated thermal fins comprise the first and second thermal fins (14, 43), and wherein a gap size (34) between the interdigitated thermal fins of the thermal joint varies across the thermal joint (e.g. Fig. 3A, 7); and oriented to extend in a direction that passes through a neutral stress point of the semiconductor package (e.g. fins pass over the entire chip, and therefore all points of chip);

(cl. 10, 24, 27) wherein the heat conducting device (40) is a package lid, cap, sink, plate or thermal hat (Fig. 3A);

³ As claimed, two fins separated by a gap read on the claim (e.g. a process of using a large gap in a single fin to divide the fin into two)

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- cl. 19) wherein gaps are formed in one or more fins (e.g. space between fins⁴)
- (cl. 21) where the joint comprises air space (gap, 34) above the first or second fins to provide vertical compliance;
- (cl. 23) where fins (e.g. closest to chip) on non active surface are mated with a plurality of second fins on the heat conducting device (Fig. 3A);
- (cl. 25, 28) heat conducting members is copper (Col. 10, Lines 33-35);
- (cl. 30) where thermal material between interdigitated fins and between the planar portion of non-active surface of chip (e.g. back surface of chip are formed of same material (Col. 11, Lines 25-27);
- (cl. 31) where thermal material between interdigitated fins and between the planar portion of non-active surface of chip (e.g. back surface of chip are formed of different material (e.g. "some times" same material; Col. 11, Lines 25-27);
- (cl. 32) passes through hot spots of the semiconductor package (e.g. fins pass over the entire chip, and therefore all points/spots area of chip);

11. With respect to the intended use limitation "to enable..." see paragraph 8 of this office action.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

⁴ As claimed, two fins separated by a gap read on the claim (e.g. a process of using a large gap in a single fin to divides the fin into two)

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the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horvath et al. (U.S. 4,649,990).

14. Kurlhara discloses the elements stated in paragraph 10 of this office action and a height and thickness of fins, but does not appear to explicitly disclose the claimed height and thickness, for example "500 microns or less."

15. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. As such, the claimed dimensions would have been obvious, since it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

16. Claims 11-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horvath et al. (U.S. 5,052,481).

17. Horvath discloses the elements stated in paragraph 10 of this office action and a height and thickness of fins, but does not appear to explicitly disclose the claimed height and thickness, for example "500 microns or less."

18. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. As such, see paragraph 15 of this office action.

19. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horvath et al. (U.S. 5,052,481) in combination with Smith (U.S. 2003/0150635).

20. Horvath discloses the elements stated in paragraph 10 of this office action and further that its chip is a semiconductor and that its heat conducting members is copper (Col. 10, Lines 33-35), but does not appear to explicitly disclose that its chip is silicon making the TCE between the material of the heat conducting device 3 times greater than the chip.

21. Smith discloses forming a semiconductor (522) from silicon (Par. 0045).

22. It would have been obvious to one of ordinary skill in the art to form the chip of Horvath from silicon in order to provide a semiconductor component as required by Horvath (Col. 8, Lines 9-10) making the TCE between the material of the heat conducting device 3 times greater than that of the chip.

Allowable Subject Matter

23. Claim 20 is objected to as being dependent upon a rejection base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims in manner that overcomes its objections.

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24. The following is a statement of reasons for the indication of allowable subject matter: the prior art does not disclose or make obvious the density of the gaps increasing toward edge regions of the semiconductor chip including all the limitations of the independent claim.


Conclusion

25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James M. Mitchell whose telephone number is (571) 272-1931. The examiner can normally be reached on M-F 8:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jmm
April 13, 2006


CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800